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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/726,705	12/04/2003	Masato Koyama	246155US2SRD	7037

22850 7590 09/20/2005

OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.  
1940 DUKE STREET  
ALEXANDRIA, VA 22314

EXAMINER
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HU, SHOUXIANG

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 09/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/726,705	KOYAMA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Shouxiang Hu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 07 May 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 7-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>1/7/05 &amp; 3/7/05</u>   | 6) <input type="checkbox"/> Other: _____                                    |

## EXAMINER'S AMENDMENT

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi (Takeshi et al., JP 2002-299607; 10-11-2002; of record) in view of Hamanaka (Hamanaka et al., US 6,548,421) and/or Tanaka (JP 1-102966; 4-22-1989).

Takeshi A method of manufacturing a semiconductor device (Figs. 1-6; also see the machine translation for rough references in English); comprising: forming an insulating layer (113; HfSiO) containing metal, silicon and oxygen on a substrate (101), such an insulating layer is naturally amorphous as it is formed with a material set and a method both substantially the same as that of the instant invention, the amorphous insulating layer further containing nitrogen in a surface region (116 or 113) thereof; and forming a polysilicon gate electrode (104) thereon.

Although Takeshi does not expressly disclose that the method further comprises a heat treatment step for dopant activation in at a temperature of between about 950 and about 1000 C-degrees in an non-oxidizing atmosphere, one of ordinary skill readily recognized that such activation heat treatment step is commonly included in such a method for activating the dopants and for improving the crystal structure of the

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semiconductor materials therein, as readily evidenced in the prior art such as:

Hamanaka (see col. 7, lines 1-10), and/or Tanaka (see its English abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the art-known activation heat treatment step of Hamanaka and/or Tanaka into the method of Takeshi, so that a method for forming a device with activated dopants and/or with improved crystal structures in the semiconductor materials would be obtained. And, such heat treatment step would inherently permit a solid-phase growth to take place in a region containing no nitrogen or low nitrogen in the amorphous insulating layer while remaining the nitrogen-containing surface region as an amorphous insulating layer, thereby forming an epitaxial crystalline insulating layer containing the metal, silicon and oxygen on and in contact with the substrate (such inherency is readily evidenced in the instant specification, such as page 16 therein).

Regarding claims 8, the nitrogen concentration in the surface region of the amorphous insulating layer in Takeshi is can be more than 10% (see Paragraph 0013 and claim 4), which naturally covers a concentration of 15 atom% or more.

Regarding claims 10 and 12, the total thickness of layer 113 in Takeshi is about 5 nm (see [0025]), which makes the thickness of the layer 116 appear to be about 2.5 nm as shown in Fig. 6C. In addition, it is noted that the thicknesses of the such layers are art-recognized parameters of importance subject to routine experimentation and optimization.

Regarding claims 11 and 13, the recited steps in the method are also disclosed in Takeshi (see [0060] and [0061]).

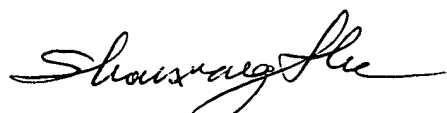
### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH  
September 14, 2005

  
**SHOUXIANG HU**  
**PRIMARY EXAMINER**